

The Succession of Insects in Tree Trunks as Shown by the Collections from the Various Stages of Decay

By

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While collecting forest insects in the San Bernardino Mountains, I was impressed with the relation that exists between the insects and their habitats. Aside from seasonal succession, there was a definite succession in the dead tree trunks as they decomposed through decay.

During the summer of 1928, six weeks were spent in the San Bernardino Mountains studying this particular phase of insect ecology. It was hoped that by studying tree trunks at all stages of decay and by recording the insects found in these, it would be possible to make an ecological classification of forest insects with reference to their habitat preference. Such a classification would not only be of interest to collectors of forest insects, but would throw some light on the method of nature in bringing tree trunks to a rapid reduction and the formation of the humus on the forest floor. The coincidence of habitat preference and seasonal succession would indicate those species where a close ecological relation might be expected.

The difficult part of this study was the setting of the arbitrary limits of the different stages of decay. After resorting to many methods, it was decided to assign five stages to all dead or dying trees and to determine to which of the five the tree in question belonged while still in the field by testing its firmness and general appearance.

Stage 1:

This was the first stage of the dying or dead trees. Trees in this stage usually contained much of fermenting sap and in a few cases there were a few live leaves still on the tree. In this stage, it was not determined whether the insects were the cause of the death of the tree or were becoming established as a result of the weakened condition of the tree caused by something else. Many alders (*Alnus rhombifolia*) and firs (*Abies concolor*) were found in this stage. Under bark insects were dominant.

Stage 2:

This stage was made up of the recently dead trees with the dead leaves still hanging on the tree. The bark was usually loosened by the under bark forms which could still be found in their tunnels. There was usually plenty of moisture under the loosened bark. At this stage termites begin to enter the sap wood and other insects bore deeper into the wood. Many yellow pines (*Pinus ponderosa*) were found and examined in this stage of decay.

Stage 3:

This stage was the well seasoned stage, usually with the bark off and generally still standing. They were quite often inhabited by such wood-borers as buprestids and termites. Maples (*Acer macrophyllum*), Kellogg Oaks (*Quercus Kelloggii*), Incense Cedars (*Libocedrus decurrens*), and sycamores (*Platanus racemosa*) represent this stage.

Stage 4:

After the wood-borers and termites had honey-combed the trunk and it became saturated with moisture, it usually became softened and permeated with the mycelium of fungus which introduced a different type of fauna to the trunk. Firs (*Abies concolor*) were examined at this stage. Fungus beetles, certain elaterids, and lucanids were found in this stage.

Stage 5:

This stage marks the end of the tree trunk as such, for in this stage it can readily be pulled apart with the hands. It is usually crumbly and dry although the inner parts of the larger logs might still be quite moist and contain certain fungi on which live snails and fungus insects are found. Large firs (*Abies concolor*) cedar (*Libocedrus decurrens*) and yellow pine (*Pinus ponderosa*) were examined for this stage.

The insects that use the tree trunk as a habitat are listed. It will be noticed that some forms occur in more than one stage or in more than one different kind of a tree, but the great majority occur in only one stage and usually in but one kind of tree.

The initial and the final stages contained less forms than any of the others. The fourth stage was the richest in insect life. Each stage has its own forms which characterize it. Since the different stages grade insensibly into each other, we would expect to find some insects occurring in two different stages only where there is no intervening stage.

Taking the alder trunk as a habitat, we find that in its weakened condition it is attacked by engravers which loosen the bark and these are followed by borers such as Cerambycidae. If it becomes dry and hard we find buprestids emerging from the wood. These borers, in the second and third stage, leave the trunk in a favorable condition to retain moisture which makes conditions more favorable for decay organisms and such forms as the lucanid, *Sinodendron rugosum*. With the drying out of what is left of the trunk, certain ants take up its powdery form as a nest habitat, or if it still remains damp, fungus permeates it and snails and fungus insects are to be found.

	STAGE 1	STAGE 2	STAGE 3	STAGE 4	STAGE 5	MONTH	TREE
Alder engraver sp?					7	alder
Buprestid larvae sp?					7	fir
Temnochila virescens					7	fir
Scolytidæ sp?					7	yellow pine
Tenebroides californicus					7-9	yellow pine
Temnochila virescens					4-7-8	yellow pine
Chariessa elegans					4	? oak
Scolytidæ 4 sp?					6	yellow pine
Cucujus clavipes					7	yellow pine
Rhagium lineatum					4	?
Neoclytus conjunctus					4	?
Xylotrechus undulatus					4	?
Synaphoeta guexi					3	{ willow sycamore alder
Asclera excavata					1	alder
Melanophila astropurpurea					4	yellow pine
Scolytidæ 1 sp?					7	fir
Termites (large) sp?					7	fir
Dicerca horni					3-4-5-6-7	{ alder willow sycamore
Polystecca californica					2-4-6	{ sycamore alder, maple
Cucujus clavipes					4	? pine
Vrilletta decorata					2	alder
Platysoma depressum					2	?
Hololepta populena					2	cottonwood
Hololepta vicina					2	sycamore
Termites sp?					6	fir
Small ants sp?					6	cedar
Tenebrionidæ sp?					7	fir
Ludius lecontei					2	alder
Alus oculatus					4	yellow pine
Elater cordatus					3	alder
Dolopius lateralis					1	willow
Ergates spiculatus					8	yellow pine
Trogosoma harrasi					8	yellow pine
Sinodendron rugosum					6-7-8	alder
Triplax californicus					2	alder
Xylocopa varipuncta					2	alder
Xylocopa orpifer					11	alder
Phloeodes diabolicus					1-2-12	cottonwood
Nyctoporis carinata					2-3-4-11	cottonwood
Hylocrinus longulus					1-2-3-11-12	{ cottonwood alder sycamore
Tenebrionidæ sp?					7	yellow pine
Fungus beetle sp?					6	fir
Termites (small) sp?					7	fir
Buprestidæ (adult) sp?					7	fir
Peltis pippingshoeldii					7	yellow pine
Eros laetus					7	cedar
Calitus scabra					6	yellow pine
Ants (large black) sp?					7	cedar
Ants (small) sp?					7	cedar
Elateridæ 4 sp?					7	cedar
Ants (stink) sp?					6	alder